ANALYZING THE STUDENTS' ACADEMIC INTEGRITY USING QUANTITATIVE METHODS[1]

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Abstract: *The transition period in Romania has generated a series of important changes, including the reforming of the Romanian tertiary education. This process has been accelerated after the signing of the Bologna treaty. Important changes were recorded in many of the quantitative aspects (such as number of student enrolled, pupil-student ratio etc) as well qualitative aspects.*

The article aims to identify and analyze the main aspects related to the academic fraud in tertiary education, within Bucharest University Center, by using a statistic-survey-based assessment performed in November 2005. The research components rely on the students' and professors' academic behavior analysis, in close accordance with education performance factors.

Key words: *academic fraud; logistic model; tertiary education*

1. Introduction

The transition has generated a series of important changes at tertiary education level also. The reform process of the Romanian tertiary education has been accelerated after the signing of the Bologna treaty. After 1989 the number of students increased greatly, by almost four times. However, during this period, the pupil – student number ratio decreased significantly.

Along the aspects related to the changes in the number of enrolled students, aspects like ethics in the academic system is one of the most important as well as discussed issues

The ethics in the Romanian universities was subject to previous studies – such as *"Sociological research – ethics in universities"* coordinated by Ana Bulai or *Barometer of students' opinion"* carried out by Team Work in The University of Bucharest in 2005. This research is addressing the whole tertiary education and is underlying the favoritism as the most significant ethical problem in the academic environment. According to the study, favoritism is signaled by 36% of the interviewed professors, 29% of the students, 24% of the auxiliary staff and 33% of the PhD students.

The paper is aiming to continue and deepen the analysis of several aspects related to academic fraud in the Romanian Universities, using statistic-survey-based assessment performed in November 2005.

2. Sample characteristics

The sample comprised 1025 students and has a 2% error tolerance. For generating the study, the following sampling variables have been used: study curricula, year of study and students' age.

The main characteristics of the three sampling variables are as follows:

1. **Study curricula**. Regarding this criteria, students have been grouped in the following categories: university (with a share of 32,3% in the total number of students), tehnical studies (27,6%), economical studies (22,2%), medicine (6,7%), law (5,5%), agriculture studies (4,0%), art, sports (1,8%). Students' allocation within the sample was proportionally with the total number of students attending day-study for each curricula. The study includes all tertiary education institutions in Bucharest, except of "Politehnica" University Bucharest, where the questionnaires where banned.
2. ***The year of study*** The sample didn't include the first year students. The distribution of the students was as following: 38.6% from the second year, 33.0% from the third year, and the difference of 28,4% from the forth and fifth year (the fifth year students are from the university of medicine.
3. ***The age of students.*** The sample's distribution of the students according to their age is presented in the following figure. The average age is 23.5 years and 69.8% are at most 25 years old. The smallest weight is corresponding to the students with the age between 30-34 years.

The analysis of the sample provided information that allowed to characterize the distribution of the students according to the following criteria: the year of high school graduation, the region of graduation (Bucharest, Moldavia, Transilvania, Dobrogea, Oltenia,

Muntenia or abroad), the average mark from the previous university year, the gender distribution, the percentage of contribution from self-earned incomes to the university taxes and expenses, the type of dwelling/accommodation (living with the parents, in a university residence, in a rented or own place).

3. Defining the variables of the logistic model

This study is defining *the student's non-academic behaviour as a fraudulent intent or the actual fraud in a written examination or the copying of projects achieved throughout the academic year in an attempt to pass the exam or get a higher grade in the exam*.

The following forms of academic behaviour breach were identified as regards the attempt of exam fraud: copying from a colleague or various prohibited sources during an exam (a), direct intervention or by intermediaries with the training professor to pass an exam or get a higher grade (b), copying of the projects developed throughout a semester from various books, scientific works (c) or directly from colleagues (d) and taking of private paid training classes with the titular professor (e). For every exam fraud procedure the frequency among faculty colleagues was registered. The distribution of the answers to this question is shown in the table hereunder:

Table 1. The distribution of the main methods of academic fraud (%)

	A	b	c	d	e
No cheating	3,3	16,3	22,8	5,9	11,0
Small proportion – under 10%	24,1	25,9	12,3	20,4	24,4
Significant proportion – 11-50%	30,1	7,7	3,3	19,2	19,8
Most of the colleagues – 51 -90%	23,1	2,7	1,9	17,2	11,3
Almost everybody – over 90%	7,2	0,4	0,7	8,9	3,2
I don't know	10,8	45,2	57,5	26,9	29,0
No answer	1,3	1,9	1,6	1,5	1,3
Total	100,0	100,0	100,0	100,0	100,0

The most frequent exam fraud method is the copying of paragraphs from books, articles, Internet or from projects submitted by students over the academic year (37.9 % of the students on an average prefer their projects to be worked-out that way – the std. deviation is of 33.12). The exam copying represents the method most frequently used by students in their attempt to pass an exam or get a higher grade (37.9 % of the students on an average resorted to such a method to pass an exam or get a higher grade – the std. deviation is of 30.21). The exam fraud by intervening with the professor or taking private paid training classes are methods less-frequently used by the students. Thus, on an average 11.1 % of the students answered that they intervened with the professor – std. deviation of 18.4, while the mean of the students taking private paid training classes to prepare for an exam is of 8.7 % - std. deviation of 19.44.

The independent variables of the model

When defining the logistic model attention must be paid to the major factors determining infringements of the academic integrity standards such as: educational process quality at each university level, the student's critical attitude towards the infringements of the academic standards by colleagues and professors, the academic integrity level of the professors and their position in relation to the exam fraud by students, time devoted by

students to individual learning, as well as to other non-professional activities, etc. To an equal extent, several attributive characteristics influencing upon the student's behaviour like the academic year, the student's gender, the allowance received for paying his/her tuition, etc.

A. The student's attitude towards the exam fraud by students is measured by means of two variables:

- ***To what extent a student encourages the exam fraud by colleagues***. The questionnaire included questions meant to measure to what extent a student allowed to be copied by a colleague during an exam (a) or his projects be copied along an academic year (b). Three answering variants were defined for each variable: 0 – never, 1 – sometimes, 2 – often enough. The results are presented I the following table:

Table 2. Frequency of academic fraud (%)

	Exam copying	Extra-classroom projects
Never	12.3	39.1
Sometimes	58.2	39.9
Often enough	26.8	15.3
Non-response	2.7	5.6
Total	100.0	100.0

These results allow the following conclusions to be drawn: i) as a rule the students allow the exam copying by colleagues; ii) the students are much more favourable to the copying of a written examination than of the projects developed along an academic year.

Moreover, the colleagues who did not allow copying during a written examination have a very bad image among the peers. A significant proportion of students (75.3 %) had a negative projection about their colleagues who did not allow exam copying: 15.7 % think that those not allowing exam copying were selfish while the opinion of 3.15 % was that "*they were no true students*".

- ***To what extent the students report to the faculty's leadership the non-academic attitude noticed in colleagues or the teaching staff at courses and seminars***. Three behavioural cases not complying with the academic standards were identified for the students: the student offers money/gifts to a professor to pass the exam or get a higher grade (a); the student copies during the exam from a colleague or from other unallowed sources (b); a colleague pays for the service of graduation diploma or project drawing up during the year (c). As far as the professors are concerned the following three situations not complying with the academic standards were identified: the professor asks for or receives money from students (d); the professor plagiarized the course he/she delivers or his/her published works (e); the professor asks his/her students to buy his/her published works (f).

Table 3. Students' behavior on reporting academic fraud (%)

	Reporting of the colleagues' non-academic attitude			Reporting of the professors' non-academic attitude		
	a	***b***	***C***	***D***	***e***	***f***
Yes	9.4	3.9	5.8	23.4	18.9	12.8
No	49.5	72.3	64.8	37.6	37.2	54.1
Do not know	38.8	20.5	26.1	36.8	40.5	30.1
Non-response	2.3	3.2	3.2	2.2	3.4	3.0

By using the six above original variables one can define the following variables derived for measuring the students position in relation to the corruption cases noticed among colleagues or professors in connection with matters associated to passing an exam or getting a higher grade:

- ***the students intent to report to the faculty's leadership a non-academic behaviour among the colleagues in order to pass an exam and work out graduation papers or projects***. In this respect, we must calculate the arithmetic mean of the three original variables used for measuring the students' intent to report the non-academic behaviour of the colleagues;
- ***the students intent to report to the faculty's leadership a non-academic behaviour among the professors***. The new variable is defined by computing the arithmetic mean of the three original variables measuring a student's intent to report to the faculty's leadership a non-academic behaviour of a professor in giving grades in an exam, in plagiarizing delivered courses and published works;
- ***the students intent to report to the faculty's leadership a non-academic behaviour among the colleagues or the professors***. This variable is a mean of the six original variables.

B. Professors benefiting from illicit gains offered by students

Three cases of illicit gains got by a professor from students by taking advantage of his/her position in the candidate/student assessment process within the higher education system. Thus three questions were added to the questionnaire in order to establish to what extent the professor asked for and accepted money from students to pass an exam or get higher grades in the entrance examination or in a customary faculty exam or specifically required his/her students to buy a manual that he/she published.The answers to the questions are summarised in Table 4.

Table 4. Perception of illicit gains of professors (%)

	A professor requested/accepted money in an exam	A professor requested/accepted money for an entrance examination	A professor specifically required the purchasing of one of his/her works
No case	37.4	45.3	18.1
1-3 cases	20.6	13.5	35.6
4-6 cases	6.4	3.3	13.0
7-10 cases	2.4	1.8	4.8
More than 10 cases	6,5	2.6	15.5
Do not know	23.3	29.9	9.7
Non-response	3.3	3.6	3.3

The following conclusions may be drawn: i) the exam fraud perception or the exam fraud suspicion is insignificant among the students; ii) the most frequent case of professors using their authority for personal purposes is obliging students to buy their works in order to get prepared for an examination. Thus, 68.9% of the students pointed to at least one such case; iii) more than 35% of the interviewed students knew of at least one case of intervention with a professor to pass an exam or get a higher grade in an exam.

The values of the three above variables that are not used to define the variables within the regression model are the following: 0 – for no case or for a "I do not know"answer, 2 – for 1-3 cases noticed, 5 – for 4-6 cases, 8.5 – for 7-10 cases, 13 – more

than 10 cases. An optimistic situation was imagined namely when the individuals having answered "I do not know" are inclined to believe that there is no major corruption at academic level for the elements considered.

The variable measuring the academic professors inclination of benefiting from their position within the system is defined based on the arithmetic mean of the following two variables: *"A professor requested or accepted money/gifts in return for a successful examination"* and *"A professor specifically required his students to buy a book or a manual he/she published"*.

C. Frequency of students attendance at courses and seminars and number of hours devoted to individual learning

The attendance at courses and seminars is measured by a variable defined as an arithmetic mean of the following two questions: *"Throughout the academic year 2004-05, how often did you attend the courses within your faculty?"*(a) and *"Throughout the academic year 2004-05, how often did you attend the seminars/laboratories within your faculty?"*(b). Thus the variable *FSCS* is determined. After processing the answers to the two questions the results in the table hereunder were obtained:

Table 5. Attendance of clases by students (%)

	I only came for the exams	I attended less than half of the courses	I attended more than half of the courses	I attended all courses	Non-response
How often did you attend the courses	0.7	9.6	54.2	35.4	0.1
How often did you attend the seminars	-	4.4	39.4	55.9	0.3

The results in the table above show a good attendance by students at the courses and seminars.

The questionnaire also included a question meant to measure the number of hours devoted on the average by every student to individual learning. The following conclusions were drawn: i) 46.3 % of the students do not devote to individual learning more than 5 hours per week while the share of those devoting more than 16 hours is of only 18.0 %; ii) the average time devoted by a student to individual learning per week is of only 8.9 hours; iii) almost 5% of the students get prepared for their examinations only during the examining session and they actually devote less one hour to individual learning over one week.

D. Educational system quality

Within this study the educational system quality is measured according to its purpose at student level. Thus three aspects were retained: i) educational system contribution to the development of the student's personality; ii) extent to which it contributes to the development of the student's integrity; iii) usefulness of the studies perceived by the students. In this respect one has to define the variables contributing to the definition of the linear regression model used for the analysis of the students non-academic behaviour:

i) ***The extent to which the studies already followed at the faculty contributed to the development of the student's personality.*** To define this variable the extent to which the faculty educational system was taken into account as regards its contribution

to the acquisition of a general culture (a), the development of specialised knowledge in the field (b), the development of clear and efficient communication skills in writing (c), the verbal communication skills (d), the development of a critical and analytical thinking (e), the use of computer and information technology (f), the solving of complex practical issues (g) and the capability of working efficiently in a team (h).

The correlation matrix of the variables defined based on the questions written down in the questionnaire looks like a positive and significant linear correlation among those variables. All the matrix values differ significantly from zero at a significance threshold of 1%.

Table 6. The correlation matrix

	A	B	c	D	e	f	g	h
a	1	0.511**	0.467**	0.480**	0.357**	0.240**	0.391**	0.373**
b		1	0.475**	0.445**	0.470**	0.361**	0.398**	0.311**
c			1	0.769**	0.497**	0.277**	0.438**	0.382**
d				1	0.538**	0.325**	0.492**	0.425**
e					1	0.449**	0.500**	0.389**
f						1	0.521**	0.538**
g							1	0.587**
h								1

** Correlation is significant at the 0.01 level (2-tailed)

ii) ***The extent to which the university studies contributed to the development of integrity*** can be measured based on three elements: extent to which the assessment and grading methods for each course are obvious (a), objectivity of the assessment and grading system (b) and extent to which the university studies contribute to the development of students integrity (c). Five numerical values were defined for the three variables, as follows: 1-leaves to be desired, 2-mediocre, 3-acceptable, 4-good, 5-excellent.

iii) ***Usefulness of the studies finished in a faculty***. In this study the usefulness of the faculty studies perceived by the students is defined in relation to his/her option of choosing to follow again the same faculty if such a possibility existed (a) and of continuing studying for a master's or doctor's degree at the same institution after graduating (b).

The questionnaire also included a question meant to measure a graduate student's intent of continuing studying for a master's or doctor's degree at another faculty (c). The answers to the three questions are shown in the table below:

Table 7. Graduate student's intent of continuing studying

	a	b	c
Undoubtedly YES	32.2	36.4	18.4
Probably YES	46.7	49.7	40.1
Probably NO	14.2	10.4	29.1
Undoubtedly NO	6.9	3.5	12.4
Total	100.0	100.0	100.0

When interpreting the data in the table above we should also consider the students chances of getting a job in their field of study. Thus, 31.7% of the interviewees feel that their

chances are high (more than 60%), 40.6% that they are moderate (between 40-60), while 26.1% are pessimistic about finding a job after graduation (less than 40%).

E. Extra-professional activities

Based on the questions provided in the questionnaire three variables are derived to characterise the time devoted to extra-professional activities:

i) ***Time devoted to work outside the campus***. This variable was chosen for several reasons: the number of hours devoted on an average per student to activities outside the campus is relatively high. This represents 6.75 hours/student over a week; the linear correlation between this variable and the grades got in an exam is a negative one and differs significantly from zero at a significance threshold of 0.01 (Pearson coefficient of -0.1); more than 50% of the students carry out an off-campus activity on a regular basis over the week;

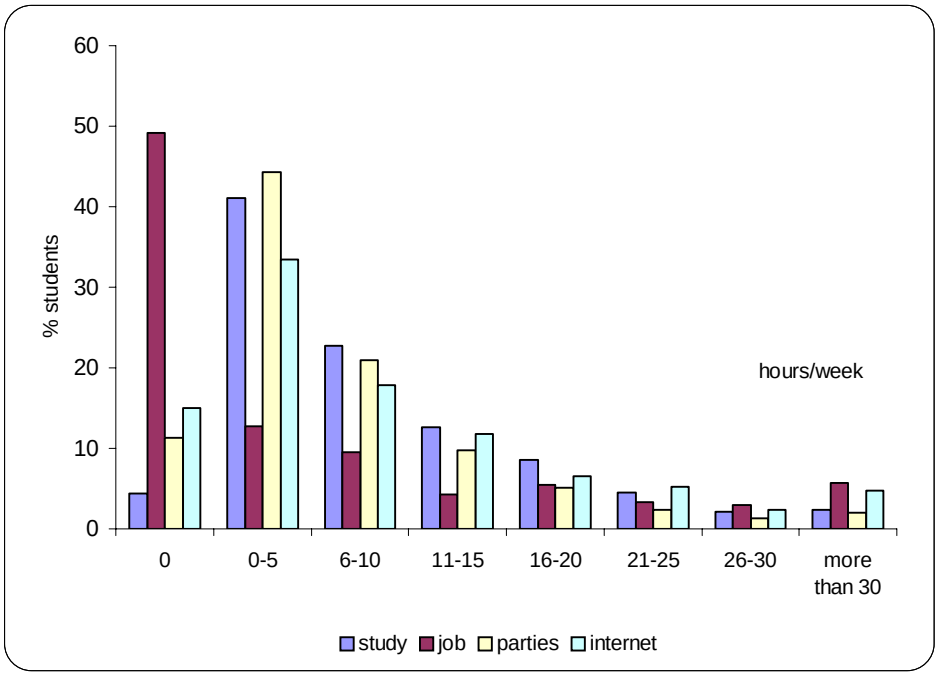

Figure 1. Breakdown of students by time dedicated to certain activities

ii) ***Time devoted to partying with friends and video or Internet games*** computed as the sum of three original variables resulting from the three questions in the questionnaire. The linear correlations between the examination results and the three variables are partially negative and significant at a significance threshold of 0.01. Thus the Pearson coefficients have values of -0.123 for parties with friends or colleagues, -0.076 for internet surfing and -0.130 for video or computer games. The correlation between the newly defined variable and the grades got in the examinations is of -0.135 being a significant value at a significance threshold of 0.01;

iii) ***Time devoted to other extra-professional activities*** computed as the sum of the time given to TV relaxation, fun reading and sports or physical training.

Table 8. Time allocation per activity hours/week

Number of hours devoted per week	Mean	Std. Deviation
Individual learning	8.85	7.84
Off-campus work	6.75	10.41
Student activities outside the courses	1.77	4.69
TV relaxation	6.23	7.04
Fun reading	6.17	6.18
Sports or physical training	5.15	6.33
Partying with friends or colleagues	7.01	7.19
Internet surfing	8.93	9.22
Video or computer games	3.81	6.90

F. General characteristics including the individual's gender (*SEX*), data relative to the payment of the university tuition fees (*PT*) and the average of the last academic year student's grades (*MED*).

4. Using the logistic model for analyzing academic fraud

The model is defined starting from the following assumption: the fraud of an exam, as dependant variable (y) is a function of the following independent variables: i) gender (x_1); ii) the level of corruption in the university induced by the behavior of the professors (x_2); iii) the performance level of the student, defined by the weekly time spent, in average for study (x_3) and the students' appreciation of their colleagues performance level (x_4), iv) the quality of the academic activity in the university, measured by the course relevance (x_5) and the course attendance (x_6); v) the free time spent outside the campus (x_7) and in extraprofessional activities (x_8); vi) the predilection to cheat an exam given similar practices during the high school (x_9).

The estimations for the logit model and its characteristics are presented in the next table:

Table 9. Characteristics logistic model

Variable	B	S.E.	Wald	Sig.	Exp (B)
1. Gender (x_1)	-0,0261	0,191	1,867	0,172	0,770
2. level of corruption in the university (x_2)	0,203	0,089	5,237	0,022	1,225
3. Level of students' academic performance					
31. Individual study (x_3)	-0,238	0,067	12,630	0,000	0,788
32. Assessment of colleagues' academic performance (x_4)	0,183	0,110	2,759	0,097	1,201
4. Quality of teaching activity					
41. Relevance of courses (x_5)	-0,224	0,087	6,605	0,010	0,799
42. Attendance at classes (x_6)	-0,543	0,164	10,934	0,001	0,581
5. Free time					

51. Extra-campus work (X_7)	-0,133	0,044	9,067	0,003	0,876
52. Extraprofessional activities (X_8)	0,268	0,070	14,631	0,000	1,307
6. Predilection to cheat in high school (X_9)	0,268	0,094	3,434	0,064	1,190
Regularity	0,488	0,749	0,424	0,515	1,628

The logistic model will be defined as follows:

P(exam fraud by cheating)=

$$= \frac{\exp(0,488-0,0261x_1+0,203x_2-0,238x_3+0,183x_4-0,224x_5-0,543x_6-0,133x_7+0,268x_8+0,268x_9)}{1+\exp(0,488-0,0261x_1+0,203x_2-0,238x_3+0,183x_4-0,224x_5-0,543x_6-0,133x_7+0,268x_8+0,268x_9)}$$

5. Conclusion

The characteristics that quantify the number of hours allocated to individual study, during a week, the relevance (perceived importance) of the course and the class attendance generate a reduction in the probability of cheating at an exam.

The students that have to work outside campus on a regular basis are less tempted to fraud an exam. On the other hand, the extraprofessional activities, such as parties and gathering with friends, internet surfing, video games tend to increase the probability of cheating at an exam. More time a student allocates to these activities, more likely to fraud the exam.

The gender has low relevance with respect to the probability to fraud an exam. Nevertheless, the female students are more inclined to cheat at an exam compared to their male colleagues.

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